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Egi

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(54) **FIXING DEVICE AND IMAGE FORMING APPARATUS**

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G03G 15/20 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 15/2053*** (2013.01); *G03G 2215/2035* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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(57) **ABSTRACT**

A fixing device includes a fixing belt, a pressuring rotator, a pressing member, a heat source, a supporting member, and an end cap. The fixing belt is rotatably provided. The pressuring rotator is rotatably provided, and comes into pressure contact with the fixing belt to form a fixing nip between the fixing belt and the pressuring rotator. The pressing member presses the fixing belt from inside toward the pressuring rotator. The heat source is disposed outside of the fixing belt, and heats the fixing belt. The supporting member faces the heat source across the fixing belt, and supports the fixing belt from inside. The end cap is mounted to an end part in the direction of a rotation axis of the fixing belt, and is rotatably supported by the supporting member.

16 Claims, 8 Drawing Sheets

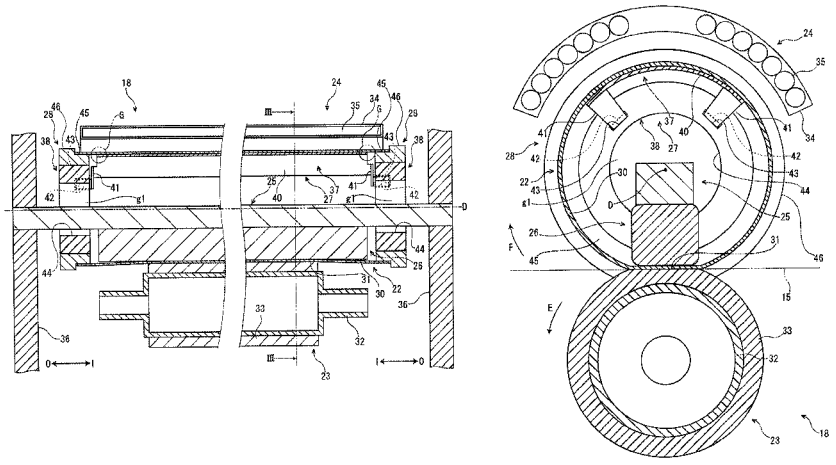

FIG. 1

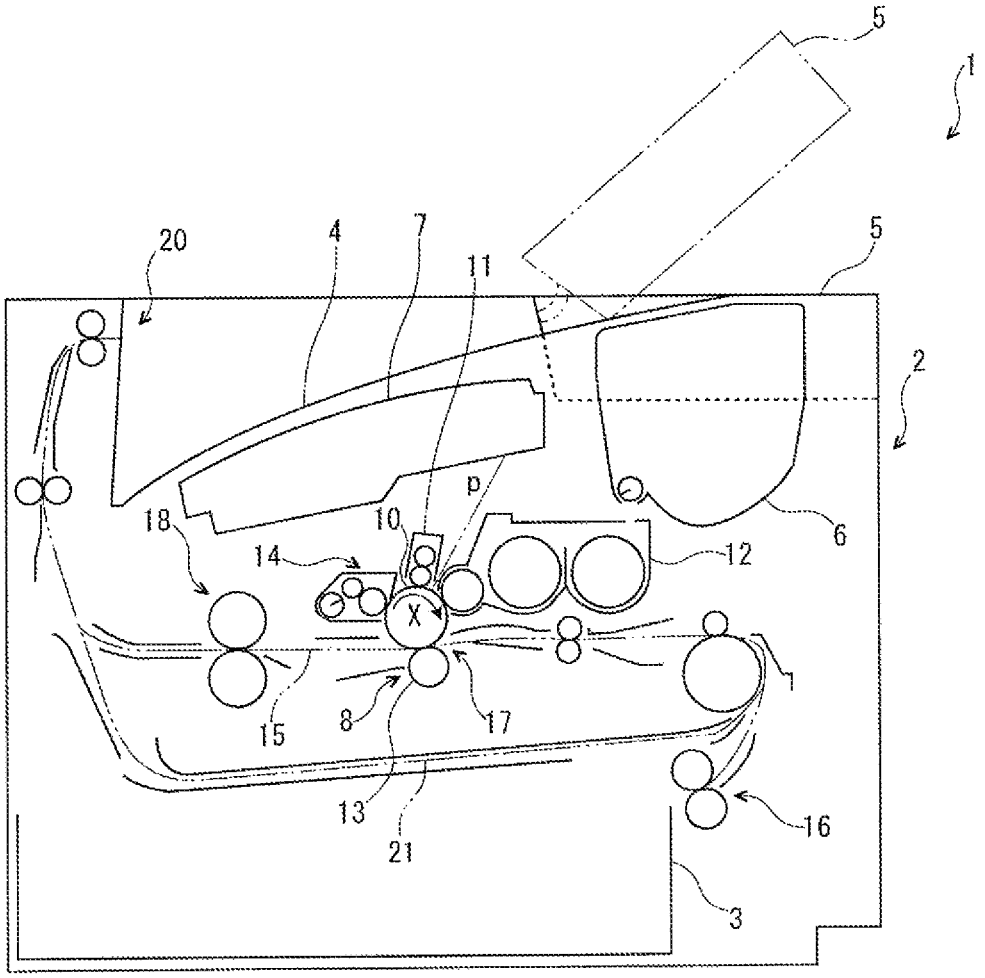

FIG. 2

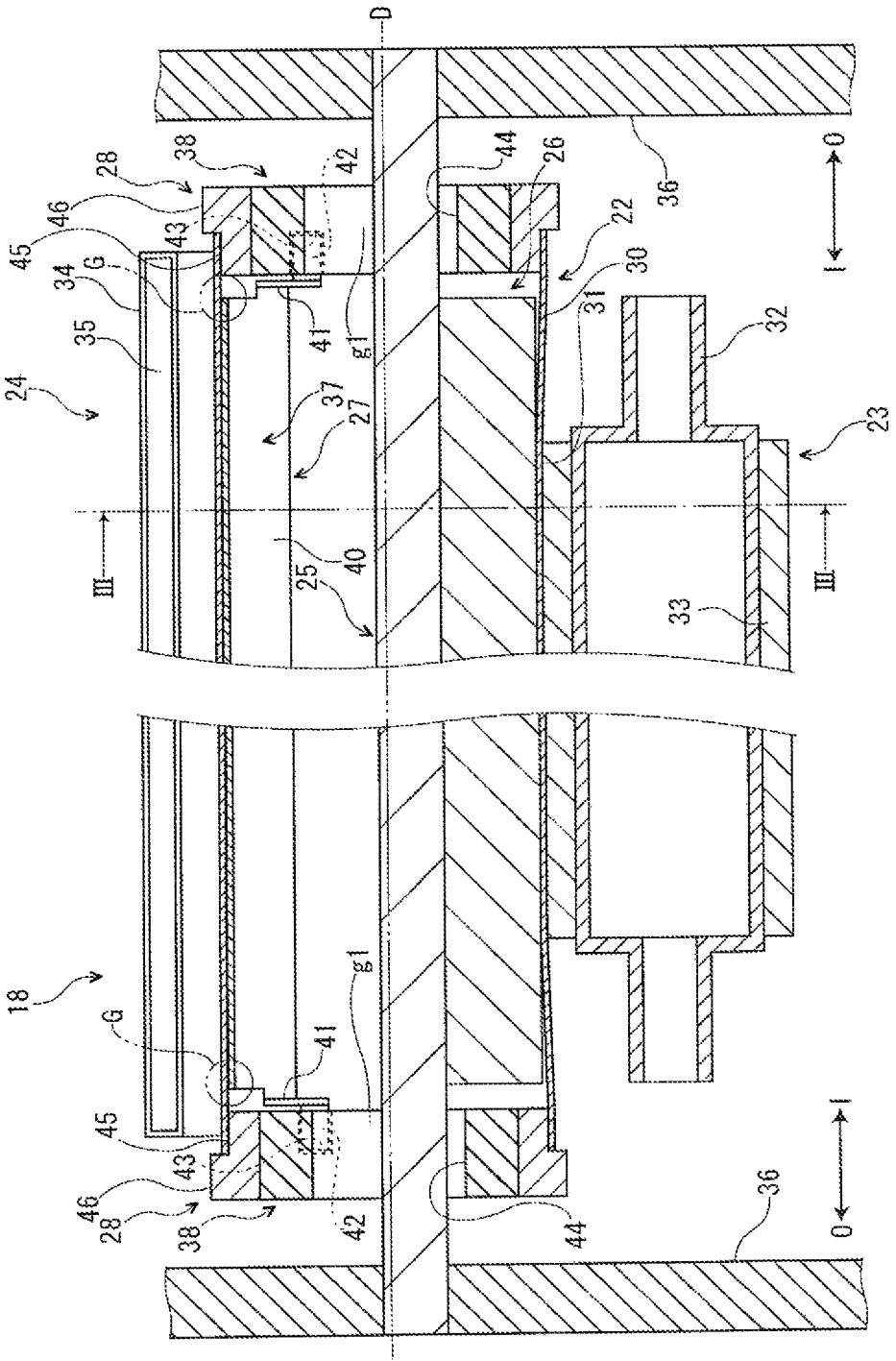
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FIG. 3

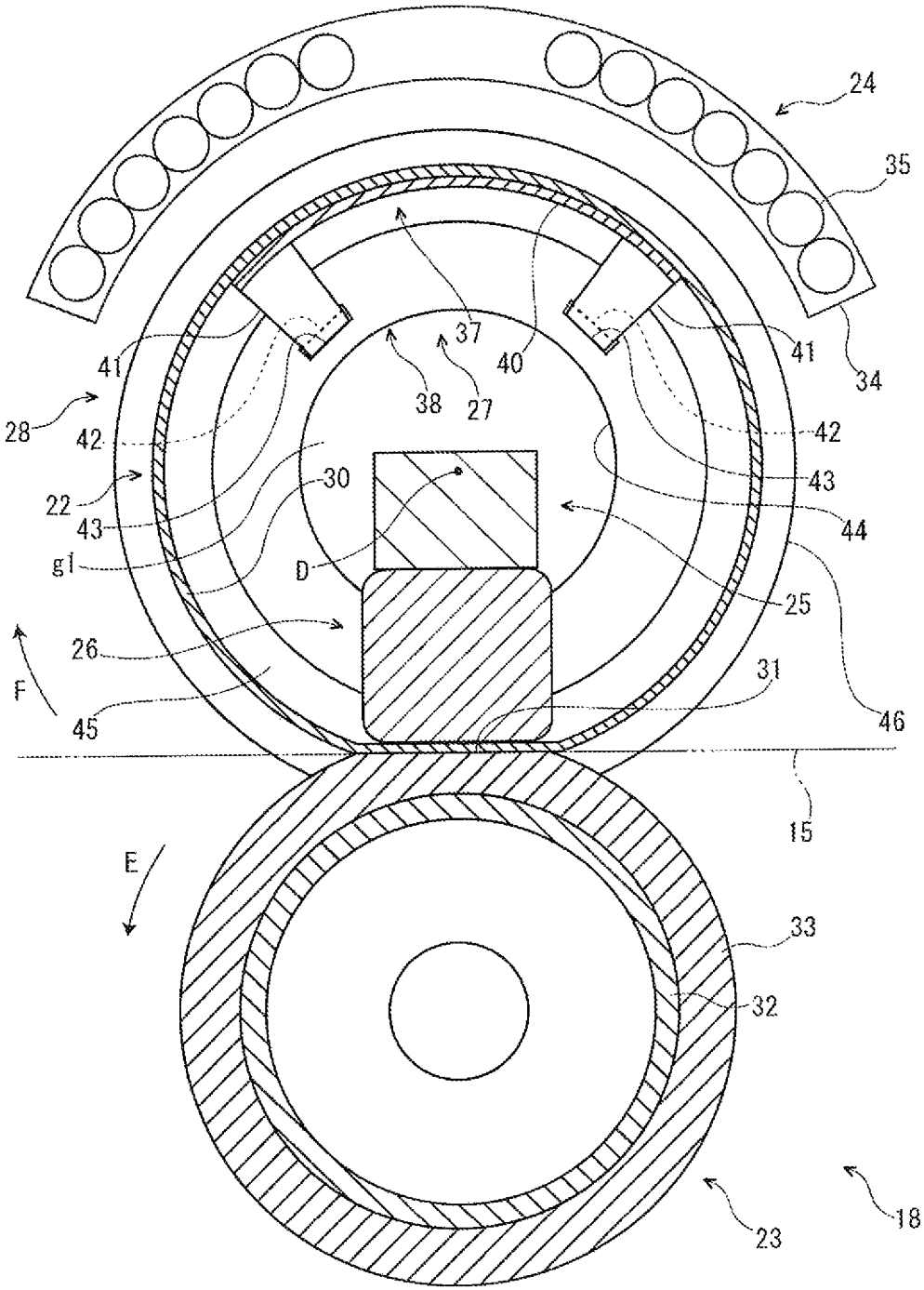
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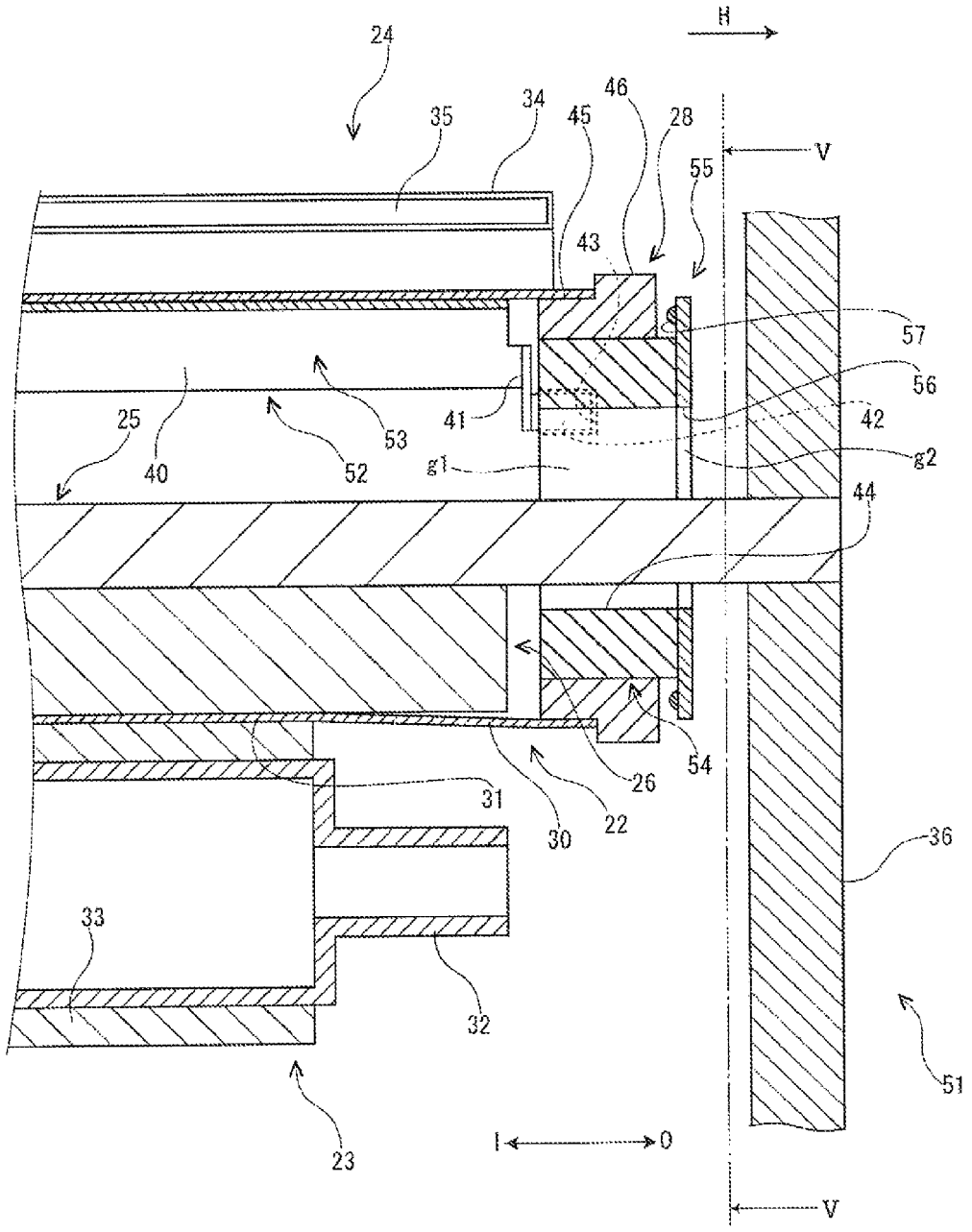
FIG. 4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V

FIG. 5

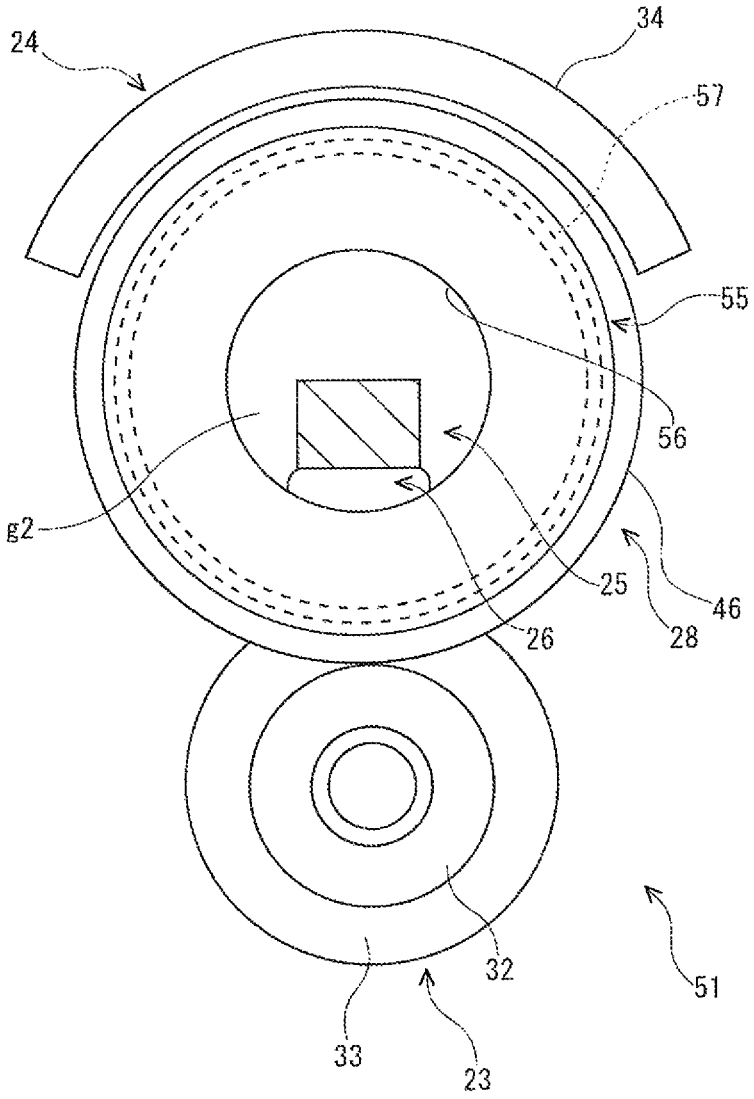


FIG. 6

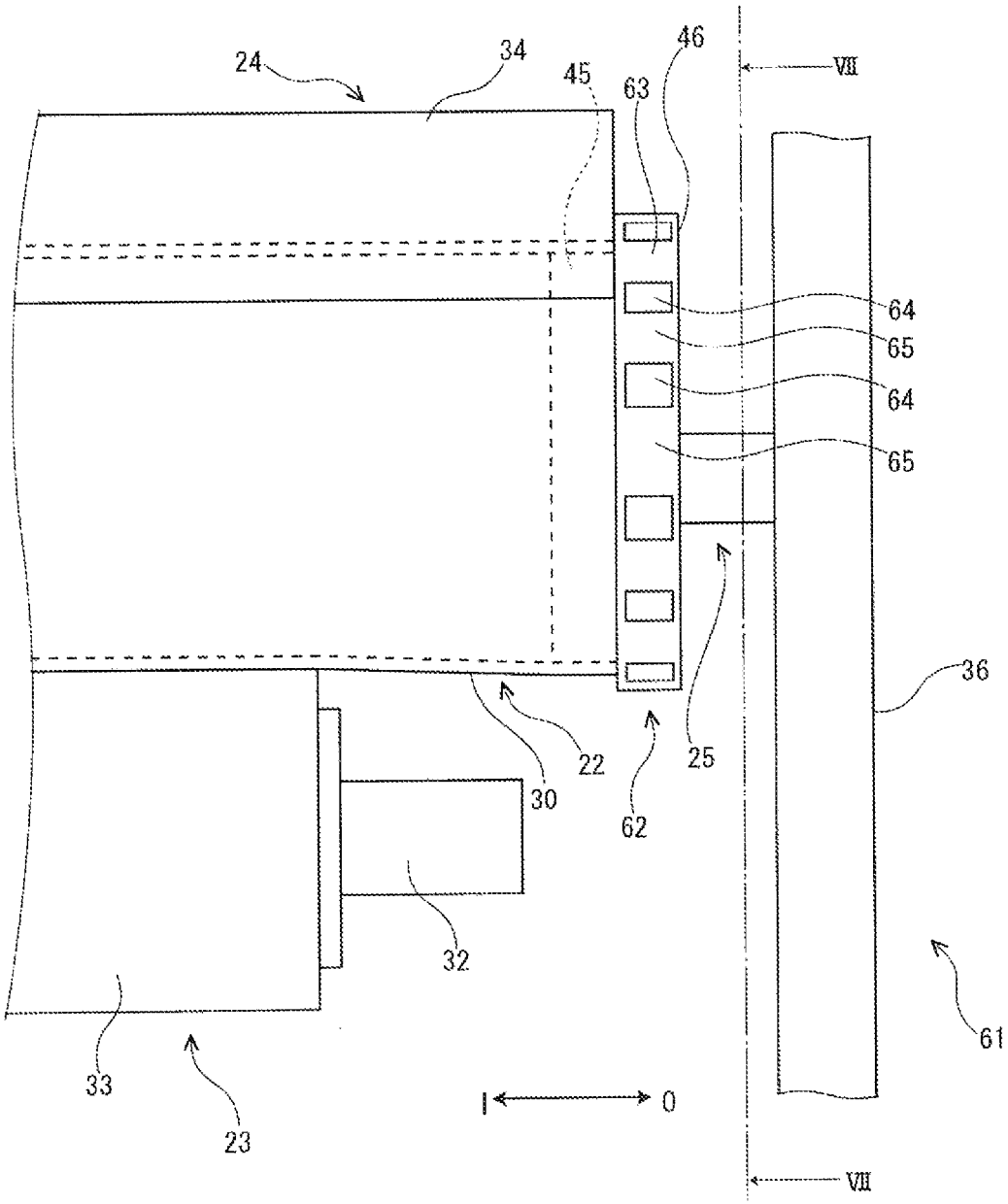


FIG. 7

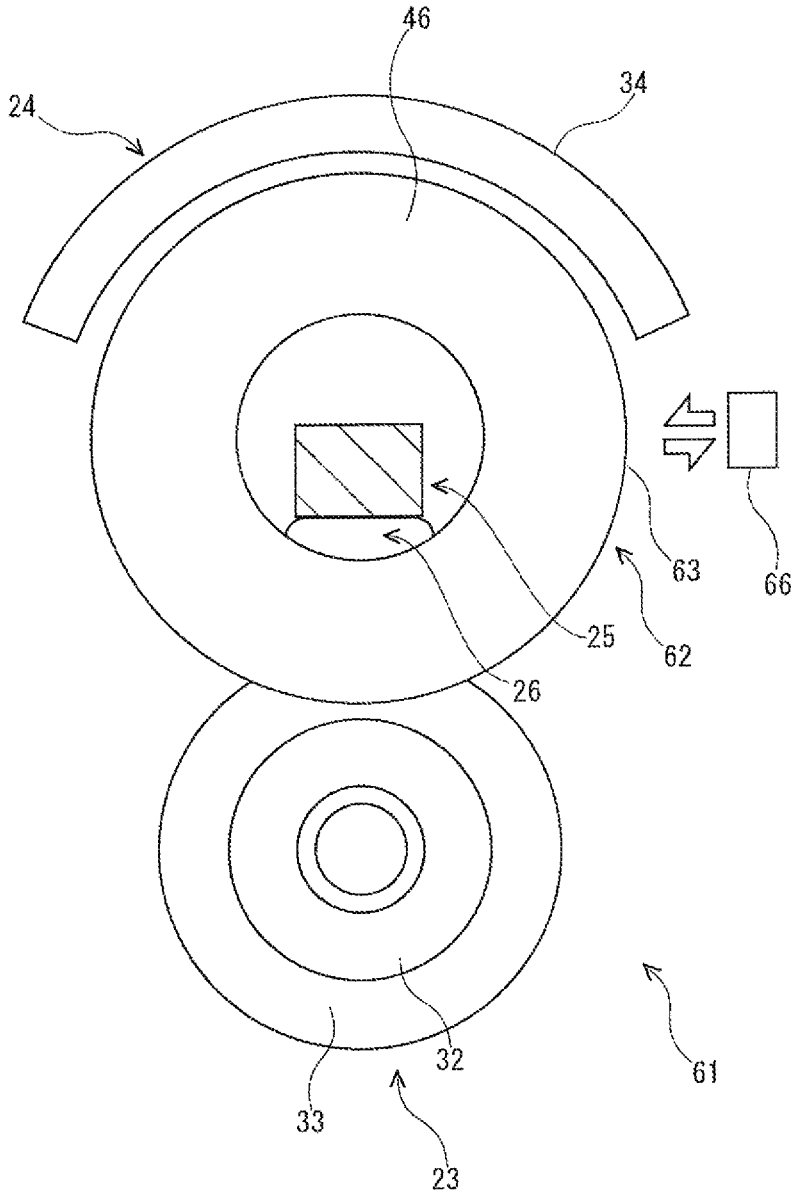


FIG. 8A

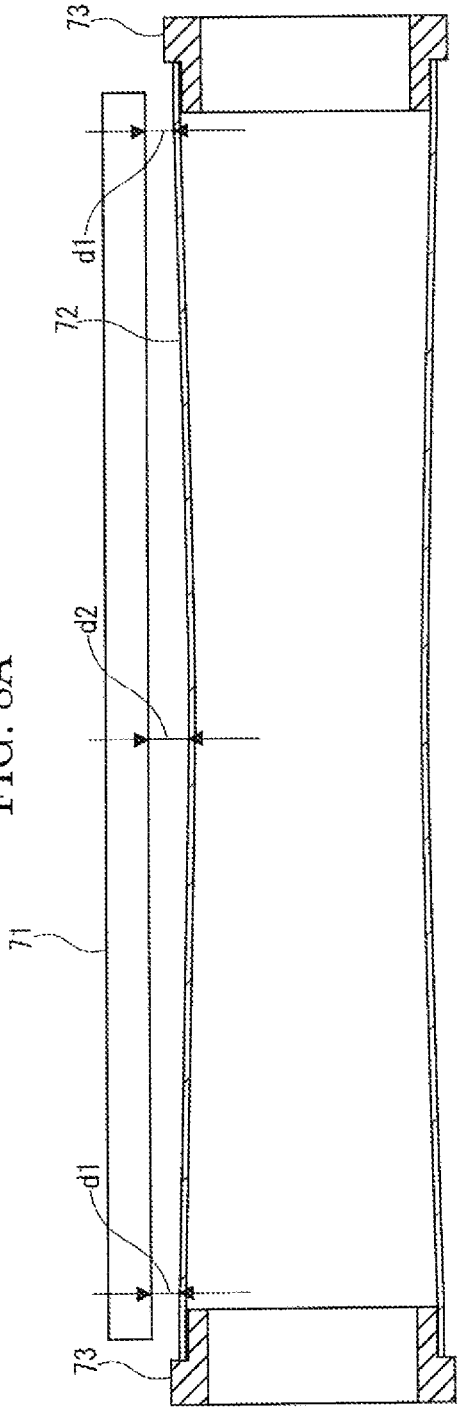
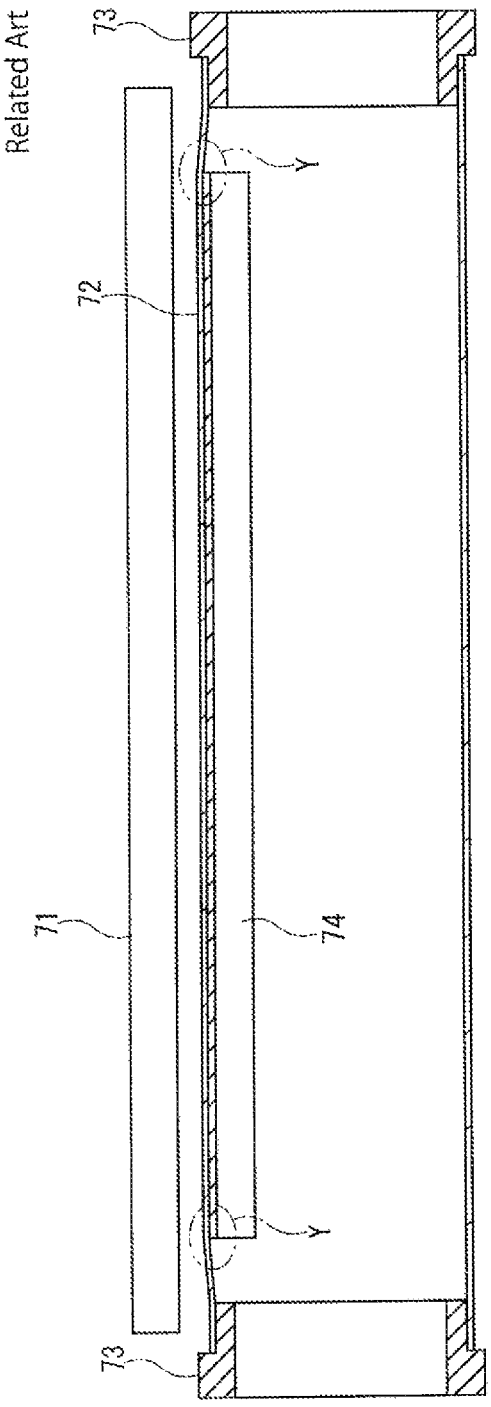


FIG. 8B



FIXING DEVICE AND IMAGE FORMING APPARATUS

INCORPORATION BY REFERENCE

This application is based on and claims the benefit of priority from Japanese Patent application No. 2013-039713 filed on Feb. 28, 2013, the entire contents of which are incorporated herein by reference.

BACKGROUND

The present disclosure relates to a fixing device configured to fix a toner image on a recording medium and an image forming apparatus provided with the fixing device.

An electrographic image forming apparatus such as a printer or a copying machine forms a toner image on a surface of a recording medium such as a sheet, and subsequently, heats and pressures the recording medium and the toner image by a fixing device, thereby fixing the toner image on the recording medium.

As a manner of the above-mentioned fixing device, a manner of forming a fixing nip for heating and pressuring a recording medium and a toner image by a fixing roller and a pressuring roller is known. The above-mentioned fixing roller is formed by covering an outer circumferential face of a metallic cored bar with a resin having a high toner release property, for example. Also, as a heat source for heating the above-mentioned fixing roller, a halogen heater is used, for example. This halogen heater is disposed inside of the cored bar of the fixing roller, for example.

On the other hand, a manner (so called IH (Induction Heating) manner) of using an IH coil as a heat source instead of the halogen heater is known. The above-mentioned IH coil generates a magnetic field by way of electrification. Among fixing devices of such IH manner, there exists a fixing device forming the fixing nip by a fixing belt and a pressuring roller instead of forming the fixing nip by a fixing roller and a pressuring roller. The above-mentioned fixing belt is composed of a rotatable endless belt. In addition, an eddy current is generated at the fixing belt byway of action of the magnetic field generated by the IH coil.

Also, as a rotation manner of the fixing belt, a manner of rotating the fixing belt together with one or a plurality of rollers disposed inside of the fixing belt is known. On the other hand, a manner of disposing a pressing member inside of the fixing belt and sliding the fixing belt with respect to the pressing member is known as well.

In the fixing device of such a manner, the fixing belt is prone to deviate to the outside in the direction of a rotation axis of the fixing belt, and one of the important problems is to restrain such deviation of the fixing belt. For example, an end cap is mounted to an end part in the direction of the rotation axis of the fixing belt (hereinafter, simply referred to as an "end part of the fixing belt"), and by the end cap, deviation of a predetermined margin or more of the fixing belt is restrained. In a case where the deviation of the fixing belt is thus restrained by using the end cap, it is desirable to rotate the end cap together with the fixing belt in order to prevent lowering of durability of an end part of the fixing belt. In addition, in order to thus rotate the end cap together with the fixing belt, the end part of the fixing belt may be corrected in a circular shape by the end cap.

A problem in a case where the end part of the fixing belt is corrected in the circular shape by the end cap as mentioned above will be described with reference to FIG. **8**A and FIG. **8**B.

In the fixing device using the IH manner and the manner of sliding the fixing belt with respect to the pressing member, a positional relationship between an IH coil **71** and a fixing belt **72** greatly influences a heating performance of the fixing belt **72**, and thus, it is desirable to enhance precision of position between the IH coil **71** and the fixing belt **72**. However, in a case where an end part of the fixing belt **72** is corrected in a circular shape by an end cap **73**, an outer diameter of the end part of the fixing belt **72** is greater than an outer diameter of a central part of the fixing belt **72**, as shown in FIG. **8**A. As a result, a distance d**1** between the end part of the fixing belt **72** and the IH coil **71** is smaller than a distance d**2** between the central part of the fixing belt **72** and the IH coil **71**. Thus, it becomes difficult to normalize (uniform) the distance between the IH coil **71** and the fixing belt **72** all over the areas in the direction of the rotation axis of the fixing belt **72**.

As a solution to such a problem, as shown in FIG. **8**B, it is considered that a supporting member **74** is disposed at a position facing the IH coil **71** across the fixing belt **72**, and by this supporting member **74**, the fixing belt **72** is supported from inside. However, if such configuration is adopted, in a case where a relative positional relationship between the fixing belt **72** and the supporting member **74** is displaced, steps occur in the fixing belt **72** in peripheral regions of both end parts of the supporting member **74** (refer to the portion Y of FIG. **8**B), a shear stress concentrates on the steps, and there is a concern about lowering of the durability of the fixing belt **72**.

SUMMARY

In accordance with an embodiment of the present disclosure, a fixing device includes a fixing belt, a pressuring rotator, a pressing member, a heat source, a supporting member, and an end cap. The fixing belt is rotatably provided. The pressuring rotator is rotatably provided, and comes into pressure contact with the fixing belt to form a fixing nip between the fixing belt and the pressuring rotator. The pressing member presses the fixing belt from inside toward the pressuring rotator. The heat source is disposed outside of the fixing belt, and heats the fixing belt. The supporting member faces the heat source across the fixing belt, and supports the fixing belt from inside. The end cap is mounted to an end part in the direction of a rotation axis of the fixing belt, and is rotatably supported by the supporting member.

In accordance with an embodiment of the present disclosure, an image forming apparatus includes a fixing device. The fixing device includes a fixing belt, a pressuring rotator, a pressing member, a heat source, a supporting member, and an end cap. The fixing belt is rotatably provided. The pressuring rotator is rotatably provided, and comes into pressure contact with the fixing belt to form a fixing nip between the fixing belt and the pressuring rotator. The pressing member presses the fixing belt from inside toward the pressuring rotator. The heat source is disposed outside of the fixing belt, and heats the fixing belt. The supporting member faces the heat source across the fixing belt, and supports the fixing belt from inside. The end cap is mounted to an end part in the direction of a rotation axis of the fixing belt, and is rotatably supported by the supporting member.

The above and other objects, features, and advantages of the present disclosure will become more apparent from the following description when taken in conjunction with the accompanying drawings in which a preferred embodiment of the present disclosure is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic view showing an outline of a configuration of a printer according to a first embodiment of the present disclosure.

FIG. **2** is a sectional side view showing a fixing device in the printer according to the first embodiment of the present disclosure.

FIG. **3** is a sectional view along the line III-III of FIG. **2**.

FIG. **4** is a sectional side view showing a fixing device in a printer according to a second embodiment of the present disclosure.

FIG. **5** is a sectional view along the line V-V of FIG. **4**.

FIG. **6** is a side view showing a fixing device in a printer according to a third embodiment of the present disclosure.

FIG. **7** is a sectional view along the line VII-VII of FIG. **6**.

FIG. **8**A and FIG. **8**B are sectional side views showing a fixing device.

DETAILED DESCRIPTION

First Embodiment

First, with reference to FIG. **1**, the entire structure of a printer **1** (an image forming apparatus) will be described. FIG. **1** is a schematic view showing an outline of a configuration of a printer according to a first embodiment of the present disclosure.

The printer **1** includes a box-formed printer main body **2**. In a lower part of the printer main body **2**, a sheet feeding cartridge **3** storing sheets (recording medium) is provided and, on an upper surface of the printer main body **2**, a sheet ejecting tray **4** is provided. On the upper surface of the printer main body **2**, an upper cover **5** is provided openably and closably near the sheet ejecting tray **4**. Below the upper cover **5**, a toner container **6** is stored.

In an upper part of the printer main body **2**, an exposure device **7** consisting of a laser scanning unit (LSU) is arranged below the sheet ejecting tray **4**. Below the exposure device **7**, an image forming unit **8** is provided. In the image forming unit **8**, a photosensitive drum **10** as an image carrier is rotatably provided. Around the photosensitive drum **10**, a charger **11**, a developing device **12**, a transferring roller **13** and a cleaning device **14** are arranged along the rotational direction of the photosensitive drum **10** (refer to an arrow X in FIG. **1**).

In the printer main body **2**, a sheet conveying path **15** is provided. At an upper stream end of the conveying path **15**, a sheet feeder **16** is provided. At an intermediate stream part of the conveying path **15**, a transferring unit **17** formed by the photosensitive drum **10** and the transferring roller **13** is provided. At a lower stream part of the conveying path **15**, a fixing device **18** is provided. At a lower stream end of the conveying path **15**, a sheet ejecting part **20** is provided. Below the conveying path **15**, an inversion path **21** for duplex printing is formed.

Next, the operation of forming an image by the printer **1** having the above-mentioned configuration will be described.

When the power is supplied to the printer **1**, various parameters are initialized and initial determination, such as temperature determination of the fixing device **18**, is carried out. Subsequently, when image data is inputted and a printing start is directed from a computer or the like connected with the printer **1**, the image forming operation is carried out as follows.

First, the surface of the photosensitive drum **10** is electrically charged by the charger **11**. Then, the surface of the photosensitive drum **10** is exposed corresponding to the image data with a laser (refer to a two-dot line P in FIG. **1**) from the exposure device **7**, thereby forming an electrostatic latent image on the surface of the photosensitive drum **10**. The electrostatic latent image is developed to a toner image with the toner (developer) by the development device **12**.

On the other hand, a sheet fed from the sheet feeding cartridge **3** by the sheet feeder **16** is conveyed to the transferring unit **17** in a suitable timing for the above-mentioned image forming operation. Then, in the transferring unit **17**, the toner image on the photosensitive drum **10** is transferred onto the sheet. The sheet with the transferred toner image is conveyed to a lower stream side on the conveying path **15** to enter the fixing device **18**, and then, the toner image is fixed on the sheet in the fixing device **18**. The sheet with the fixed toner image is ejected from the sheet ejecting part **20** on the sheet ejecting tray **4**. The toner remained on the photosensitive drum **10** is collected by the cleaning device **14**.

Next, a fixing device **18** will be described with reference to FIG. **2** and FIG. **3**.

Hereinafter, for the sake of convenience of explanation, the left side of the sheet in FIG. **2** (the frontal side of the sheet in FIG. **3**) corresponds to a front side (foreside) of the fixing device **18**. Also, an arrow I of FIG. **2** indicates inside in a forward or backward direction, and an arrow O of FIG. **2** indicates outside in the forward or backward direction.

As shown in FIG. **2** and FIG. **3**, the fixing device **18** includes a fixing belt **22**, a pressuring roller **23** (pressuring rotator) disposed downward of the fixing belt **22**, an IH fixing unit **24** disposed upward of the fixing belt **22**, a holding member **25** disposed inside of the fixing belt **22**, a pressing pad **26** (pressing member) disposed downward of the holding member **25**, a supporting member **27** disposed upward of the holding member **25**, and end caps **28** respectively disposed at both end sides in the forward or backward direction of the fixing belt **22**.

First, the fixing belt **22** will be described. The fixing belt **22** is an endless thin belt having flexibility, and forms an elongated cylindrical shape in the forward or backward direction. The fixing belt **22** is rotatable around a rotation axis D extending in the forward or backward direction. Namely, in the embodiment, the forward or backward direction is a direction of the rotation axis of the fixing belt **22**.

The fixing belt **22** is composed of a substrate layer **30** and a release layer (not shown) covering the substrate layer **30**, for example. The substrate layer **30** of the fixing belt **22** is made of a metal such as nickel or stainless or a resin such as PI (Polyimide), for example. The release layer of the fixing belt **22** is made of a fluorine-based resin such as PFA, for example. The fixing belt **22** may include an elastic layer between the substrate layer **30** and the release layer. This elastic layer is made of a silicone rubber, for example.

Next, the pressuring roller **23** will be described. The pressuring roller **23** forms an elongated cylindrical shape in the forward or backward direction. The pressuring roller **23** comes into pressure contact with the fixing belt **22**, and a fixing nip **31** is formed between the fixing belt **22** and the pressuring roller **23**. When a sheet passes through the fixing nip **31**, the sheet and the toner image are heated and pressured, and the toner image is fixed to the sheet.

The pressuring roller **23** is rotatably supported by a fixing frame (not shown). The pressuring roller **23** is connected to a drive source (not shown), and when the pressuring roller **23** is rotated by the drive source, the fixing belt **22** rotates in the opposite direction to the pressuring roller **23** accompanying with the rotation of the pressuring roller **23**. The pressuring

roller **23** is configured to convey the sheet to a downstream side of the conveying path **15** in cooperation with the fixing belt **22**.

The pressuring roller **23** is composed of a cylindrical cored bar **32**, an elastic layer **33** provided around the cored bar **32**, and a release layer (not shown) covering the elastic layer **33**, for example. The cored bar **32** of the pressuring roller **23** is made of a metal such as stainless or aluminum, for example. The elastic layer **33** of the pressuring roller **23** is made of a silicone rubber or a silicone sponge, for example. The release layer of the pressuring roller **23** is made of a fluorine-based resin such as PFA, for example.

Next, the IH fixing unit **24** will be described. The IH fixing unit **24** includes a casing member **34** and an IH coil **35** (heat source) housed in the casing member **34**. The IH coil **35** is disposed outside of the fixing belt **22**, and is provided in an arc shape along an outer circumference of the fixing belt **22**. The IH coil **35** is configured to generate a magnetic field when a high-frequency current is fed to the IH coil **35**.

Next, the holding member **25** will be described. The holding member **25** extends in the forward or backward direction, and has a rectangular sectional shape. The holding member **25** passes through a substantial center in a vertical direction of the fixing belt **22** (precisely, slightly lower than the center in the vertical direction of the fixing belt **22**). Both end parts in the forward or backward direction of the holding member **25** are fixed to locking members **36** (refer to FIG. **2**) respectively disposed forward and backward of the fixing belt **22**. The locking member **36** is fixed to a fixing frame (not shown) or forms a part of the fixing frame, for example.

Next, the pressing pad **26** will be described. The pressing pad **26** extends in a forward or backward direction, and has a substantially rectangular sectional shape. The pressing pad **26** is housed in a lower end part of the fixing belt **22**. A top face of the pressing pad **26** is fixed to a bottom face of the holding member **25**. In this manner, the pressing pad **26** is held by the holding member **25**. A lower end part of the pressing pad **26** comes into contact with an inner circumferential face of the fixing belt **22**, and presses the fixing belt **22** from inside toward the pressuring roller **23**. As the fixing belt **22** rotates, the fixing belt **22** slides with respect to the pressing pad **26**. The pressing pad **26** comes into contact with only a lower part (a part of the fixing nip **31** side) of an inner circumferential face of the fixing belt **22**.

Next, the supporting member **27** will be described. The supporting member **27** includes a belt supporting part **37** and cap supporting parts **38** disposed on both end sides in the forward or backward direction of the belt supporting part **37**.

The belt supporting part **37** is housed in an upper end part of the fixing belt **22**. The belt supporting part **37** is formed by bending a thin plate, for example. The belt supporting part **37** is made of a material developing heat by a magnetic field generated by the IH coil **35**, for example, a magnetic shunt metal such as Fe—Ni alloy. The belt supporting part **37** is not fixed to the holding member **25**, and is movable with respect to the holding member **25**.

The belt supporting part **37** includes, a supporting piece **40** extending in a forward or backward direction, connecting pieces **41** bent from both end parts of the supporting piece **40** toward inside in a radial direction (rotation axis D side), and fitting pieces **42** bent from an end part inside in a radial direction of the connecting piece **41** toward outside in the forward or backward direction. The supporting piece **40** forms a thin-plate shape, and curves upward in an arc shape. The supporting piece **40** faces the IH coil **35** across the fixing belt **22**. The supporting piece **40** supports the fixing belt **22** from inside. The connecting pieces **41** and the fitting pieces **42** form a thin plate shape, and are formed on the left and right in a pair.

Each cap supporting part **38** forms a cylindrical shape. An end part inside in the forward or backward direction of each cap supporting part **38** is inserted into the fixing belt **22**, and another end part outside in the forward or backward direction of each cap supporting part **38** protrudes from the fixing belt **22**. On a face inside in the forward or backward direction of each cap supporting part **38**, a pair of left and right fitting holes **43** are provided, and each fitting piece **42** of the belt supporting part **37** fits into each fitting hole **43**. In this manner, the cap supporting part **38** is fixed to both end parts in the forward or backward direction of the belt supporting part **37**.

In each cap supporting part **38**, a circular through hole **44** is formed along the forward or backward direction, and the holding member **25** passes through the through hole **44**. A gap **g1** is formed between an outer circumferential face of the holding member **25** and the through hole **44**.

Next, the end caps **28** will be described. Each end cap **28** forms a cylindrical shape, and is rotatably attached to the outer circumference of each cap supporting part **38** of the supporting member **27**. In this manner, each end cap **28** is rotatably supported by each cap supporting part **38**. Each end cap **28** includes a fixed part **45** and an engagingly locking part **46** provided outside in the forward or backward direction of the fixed part **45**. Since an outer diameter of the fixed part **45** is smaller than an outer diameter of the engagingly locking part **46**, a boundary part between the fixed part **45** and the engagingly locking part **46** forms a stepped shape. An outer circumferential face of the fixed part **45** is fixed to each end part in the forward or backward direction of an inner circumferential face of the fixing belt **22**. In this manner, each end cap **28** is mounted to each end part in the forward or backward direction of the fixing belt **22**. The fixed part **45** corrects each end part in the forward or backward direction (opening part) of the fixing belt **22** in a circular shape. The engagingly locking part **46** engagingly locks each end part in the forward or backward direction of the fixing belt **22**.

In the constituent elements as described above, when the toner image is fixed to a sheet, the pressuring roller **23** is rotated by a drive source (not shown) (refer to an arrow E of FIG. **3**). When the pressuring roller **23** is thus rotated, the fixing belt **22** brought into pressure contact with the pressuring roller **23** rotates in an opposite direction to the pressuring roller **23** (refer to an arrow F of FIG. **3**). Accompanying with this, each end cap **28** mounted to each end part in the forward or backward direction of the fixing belt **22** rotates together with the fixing belt **22**. Even if the pressuring roller **23**, the fixing belt **22**, and each end cap **28** rotate, the IH fixing unit **24**, the holding member **25**, the pressing pad **26**, and the supporting member **27** hold an inactive state.

When the toner image is fixed to the sheet, a high-frequency current is fed to the IH coil **35**. Accompanying with this, the IH coil **35** generates a magnetic field, and by way of action of this magnetic field, an eddy current is generated at the fixing belt **22**, and then, the fixing belt **22** develops heat. Further, the belt supporting part **37** of the supporting member **27** develop heat by the magnetic field generated by the IH coil **35**, and by the belt supporting part **37**, the fixing belt **22** is heated. In this state, when the sheet passes through the fixing nip **31**, the sheet and the toner image are heated and pressured, and then, the toner image is fixed to the sheet.

In the embodiment, as described above, the end caps **28** are rotatably supported by the cap supporting parts **38** of the supporting member **27**. Thus, a position of a rotational center of the end cap **28** is determined by the supporting member **27**,

it is possible to prevent a displacement in a relative positional relationship between the end cap **28** and the supporting member **27**. Accompanying with this, it is possible to prevent displacement of a relative positional relationship between the fixing belt **22** and the supporting member **27**, and it is possible to avoid occurrence of steps in the fixing belt **22** in a peripheral region of both end parts of the belt supporting part **37** (refer to a portion G of FIG. **2**). Thus, in the peripheral region of both end parts of the belt supporting part **37**, it is possible to prevent a shear stress from concentrating on the fixing belt **22** and the durability of fixing belt **22** can be improved.

Each end part in the forward or backward direction of the fixing belt **22** is corrected in a circular shape by the fixed part **45** of each end cap **28**, and each end cap **28** rotates together with the fixing belt **22**. Thus, it is possible to prevent an occurrence of crack or breakage at both end parts in the forward or backward direction of the fixing belt **22** due to a friction with the end cap **28**, and in this respect also, the durability of the fixing belt **22** can be improved.

Further, since the fixing belt **22** is supported from inside by the belt supporting part **37** of the supporting member **27**, it is possible to normalize (uniform) a distance between the IH coil **35** and the fixing belt **22** all over the areas in the forward or backward direction. Accompanying with this, the heating performance of the fixing belt **22** can be improved.

Also, the supporting member **27** is composed of the belt supporting part **37** supporting the fixing belt **22** from inside and the cap supporting parts **38** fixed to both end parts in the forward or backward direction of the belt supporting part **37** and rotatably supporting the end cap **28**. Thus, both of the fixing belt **22** and the end cap **28** can be reliably supported by the supporting member **27**.

In addition, the holding member **25** passes through the through hole **44** provided in each cap supporting part **38**. Thus, the holding member **25** can be fixed to a locking member **36** provided outside in the forward or backward direction of the cap supporting part **38** and a fixing strength of the holding member **25** can be increased. Accompanying with this, the pressing pad **26** can be reliably held by the holding member **25**.

Further, since the IH coil **35** is used as the heat source, it is possible to improve efficiency and velocity of heating the fixing belt **22** in comparison with a case of using a halogen heater or the like as a heat source. Furthermore, since the belt supporting part **37** of the supporting member **27** is made of a material developing heat by the magnetic field generated by the IH coil **35**, it is possible to heat the fixing belt **22** by the belt supporting part **37**, and it is possible to further improve the efficiency and velocity of heating the fixing belt **22**.

In the embodiment, the gap g**1** is formed between the through hole **44** of each cap supporting part **38** and the outer circumferential face of the holding member **25**. On the other hand, in another embodiment, an elastic member may be interposed between the through hole **44** of each cap supporting part **38** and the outer circumferential face of the holding member **25**. This elastic member can be made of a silicone sponge or rubber, for example.

In the embodiment, drive is inputted from the drive source (not shown) to only the pressuring roller **23**. On the other hand, in another embodiment, drive may be inputted from the drive source to only the end cap **28**, drive may be inputted from the drive source to both of the pressuring roller **23** and the end cap **28**, and when drive is inputted to the end cap **28**, for example, a gear is provided on the outer circumferential face of an engagingly locking part **46** of the end cap **28**, and the gear may be connected to the drive source.

In the embodiment, belt supporting part **37** and the cap supporting part **38** of the supporting member **27** are separately formed. On the other hand, in another embodiment, the belt supporting part **37** and the cap supporting part **38** of the supporting member **27** may be integrally formed.

In the embodiment, the IH coil **35** is used as a heat source. On the other hand, in another embodiment, a heater such as a halogen heater or a ceramics heater may be used as a heat source.

In the embodiment, the configuration of the disclosure is applied to the printer **1**. On the other hand, in another embodiment, the configuration of the disclosure may be applied to a copying machine, a facsimile, a multifunction peripheral or the like.

Second Embodiment

Next, a fixing device **51** according to a second embodiment of the present disclosure will be described with reference to FIG. **4** and FIG. **5**. An arrow I of FIG. **4** indicates inside in the forward or backward direction, and an arrow O of FIG. **4** indicates outside in the forward or backward direction. Since constituent elements other than a supporting member **52** are similar to those of the first embodiment, these constituent elements in the figures are designated by the same reference numerals as those of the first embodiment, and a duplicate description thereof is omitted.

The supporting member **52** includes a belt supporting part **53**, cap supporting parts **54** disposed on both end sides in a forward or backward direction of the belt supporting part **53**, and deviation-preventing parts **55** disposed outside in the forward or backward direction of the cap supporting parts **54**.

A configuration of the belt supporting part **53** is similar to a configuration of the belt supporting part **37** of the first embodiment. Thus, the constituent elements of the belt supporting part **53** are designated by the same reference numerals as those of the constituent elements of the belt supporting part **37** of the first embodiment, and a duplicate description thereof is omitted. A configuration of the cap supporting parts **54** is similar to a configuration of the cap supporting parts **38** of the first embodiment except that an end part outside in the forward or backward direction of each cap supporting part **54** is more protrusive to the outside of the forward or backward direction than the end cap **28**. Thus, the constituent elements of the cap supporting parts **54** are designated by the same reference numerals as those of the constituent elements of the cap supporting parts **38** of the first embodiment, and a duplicate description thereof is omitted.

Each deviation-preventing part **55** forms a circular ring shape. An inner circumferential part of a face inside in the forward or backward direction of each deviation-preventing part **55** is fixed to a face outside in the forward or backward direction of each cap supporting part **54**. In each deviation-preventing part **55**, a communication hole **56** is formed along the forward or backward direction. The communication hole **56** communicates with the through hole **44** of each cap supporting part **54**. The holding member **25** passes through the communication hole **56**. A gap g**2** is formed between the communication hole **56** and the outer circumferential face of the holding member **25**.

The outer circumferential part of each deviation-preventing part **55** is disposed outside in the forward or backward direction of each end cap **28**. A circular projection **57** is provided at an outer circumferential part of the face inside in the forward or backward direction of each deviation-preventing part **55**.

In the constituent elements as described above, when the fixing belt **22** rotates, the fixing belt **22** deviates to outside in the forward or backward direction (refer to an arrow H of FIG. **4**). When the fixing belt **22** thus deviates to the outside in the forward or backward direction, the end cap **28** comes into contact with the projection **57** of the deviation-preventing part **55**. In this manner, it is possible to reliably prevent the fixing belt **22** from deviates to the outside in the forward or backward direction by a predetermined margin or more.

Third Embodiment

Next, a fixing device **61** according to a third embodiment of the present disclosure will be described with reference to FIG. **6** and FIG. **7**. An arrow I of FIG. **6** indicates inside in a forward or backward direction, and an arrow O of FIG. **6** indicates outside in the forward or backward direction. Since constituent elements other than the end cap **62** are similar to those of the first embodiment, these constituent elements are designated by the same reference numerals as those of the first embodiment, and a duplicate description thereof is omitted. As to the end cap **62**, the similar constituent elements to those of the first embodiment are designated in the figures by the same reference numerals as those of the end cap **28** of the first embodiment, and a duplicate description thereof is omitted.

A detected part **63** is provided on an outer circumferential face of an engagingly locking part **46** of the end cap **62**. In the detected part **63**, an applied part **64** to which coating is applied and a non-applied part **65** to which no coating is applied, are alternately provided in a circumferential direction.

A sensor **66** is disposed lateral of the engagingly locking part **46** of the end cap **62**. The sensor **66** is a reflective PI sensor (Photo Interrupter Sensor), for example. The sensor **66** includes a light emitting part configured to emit light toward the detected part **63** and a light receiving part configured to receive light reflected from the detected part **63**.

In the constituent elements as mentioned above, in a state in which the detected part **63** is not rotating, namely in a state in which the fixing belt **22** and the end cap **62** are not rotating, the light emitted from the light emitting part of the sensor **66** continuously hits either the applied part **64** or the non-applied part **65** of the detected part **63**. Thus, the light reception amount of the light receiving part of the sensor **66** is kept constant. In this case, it is possible to determine that the fixing belt **22** is not rotating.

On the other hand, in a state in which the detected part **63** is rotating, namely in a state in which the fixing belt **22** and the end cap **62** are rotating, since the light emitted from the light emitting part of the sensor **66** alternately hits the applied part **64** and the non-applied part **65** of the detected part **63**, the light reception amount of the light receiving part of the sensor **66** switches. In this case, it is possible to determine that the fixing belt **22** is rotating.

As described above, in the embodiment, rotation of the detected part **63** of the end cap **62** can be detected by the sensor **66**. Thus, it is possible to determine whether or not the fixing belt **22** is rotating, based on a result of detection of the sensor **66**, and it is possible to avoid a circumstance that the fixing belt **22** is heated by the IH coil **35** in the state in which the fixing belt **22** is not rotating.

While the present disclosure has been described with reference to the particular illustrative embodiments, it is not to be restricted by the embodiments. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present disclosure.

What is claimed is:

1. A fixing device comprising:

a fixing belt rotatably provided;

a pressuring rotator rotatably provided and coming into pressure contact with the fixing belt to form a fixing nip between the fixing belt and the pressuring rotator;

a pressing member configured to press the fixing belt from inside toward the pressuring rotator;

a heat source disposed outside of the fixing belt and configured to heat the fixing belt;

a supporting member facing the heat source across the fixing belt and configured to support the fixing belt from inside;

an end cap mounted to an end part in a direction of a rotation axis of the fixing belt and rotatably supported by the supporting member; and

a holding member extending in the direction of the rotation axis and configured to hold the pressing member,

wherein the supporting member includes:

a belt supporting part configured to support the fixing belt from inside; and

a cap supporting part fixed to an end part in the direction of the rotation axis of the belt supporting part and configured to rotatably support the end cap,

wherein the cap supporting part includes a through hole formed along the direction of the rotation axis and the holding member passes through the through hole.

2. The fixing device according to claim **1**, wherein the supporting member includes a deviation-preventing part disposed outside in the direction of the rotation axis of the end cap.

3. The fixing device according to claim **2**, wherein a circular projection is provided on a face inside in the direction of the rotation axis of the deviation-preventing part.

4. The fixing device according to claim **1**, further comprising:

a detected part provided on an outer circumferential face of the end cap; and

a sensor configured to detect rotation of the detected part.

5. The fixing device according to claim **1**, wherein the heat source is an IH coil configured to generate a magnetic field to heat the fixing belt.

6. The fixing device according to claim **5**, wherein at least a part of the supporting member is made of a material developing heat by a magnetic field generated by the IH coil.

7. A fixing device comprising:

a fixing belt rotatably provided;

a pressuring rotator rotatably provided and coming into pressure contact with the fixing belt to form a fixing nip between the fixing belt and the pressuring rotator;

a pressing member configured to press the fixing belt from inside toward the pressuring rotator;

a heat source disposed outside of the fixing belt and configured to heat the fixing belt;

a supporting member facing the heat source across the fixing belt and configured to support the fixing belt from inside; and

an end cap mounted to an end part in a direction of a rotation axis of the fixing belt and rotatably supported by the supporting member,

wherein the supporting member includes:

a belt supporting part configured to support the fixing belt from inside; and

a cap supporting part fixed to an end part in the direction of the rotation axis of the belt supporting part and configured to rotatably support the end cap,

wherein the belt supporting part includes:

a supporting piece extending in the direction of the rotation axis and configured to support the fixing belt from inside;

a connecting piece bent from an end part in the direction of the rotation axis of the supporting piece toward inside in a radial direction; and

a fitting piece bent from an end part inside in the radial direction of the connecting piece toward outside in the direction of the rotation axis, wherein

a fitting hole into which the fitting piece fits is provided on a face inside in the direction of the rotation axis of the cap supporting part.

8. The fixing device according to claim **7**, wherein the fitting pieces and the fitting holes are provided in a pair.

9. An image forming apparatus comprising

a fixing device configured to include:

a fixing belt rotatably provided;

a pressuring rotator rotatably provided and coming into pressure contact with the fixing belt to form a fixing nip between the fixing belt and the pressuring rotator;

a pressing member configured to press the fixing belt from inside toward the pressuring rotator;

a heat source disposed outside of the fixing belt and configured to heat the fixing belt;

a supporting member facing the heat source across the fixing belt and configured to support the fixing belt from inside;

an end cap mounted to an end part in a direction of a rotation axis of the fixing belt and rotatably supported by the supporting member; and

a holding member extending in the direction of the rotation axis and configured to hold the pressing member,

wherein the supporting member includes:

a belt supporting part configured to support the fixing belt from inside; and

a cap supporting part fixed to an end part in the direction of the rotation axis of the belt supporting part and configured to rotatably support the end cap,

wherein the cap supporting part includes a through hole formed along the direction of the rotation axis and the holding member passes through the through hole.

10. The image forming apparatus according to claim **9**, wherein the belt supporting part includes:

a supporting piece extending in the direction of the rotation axis and configured to support the fixing belt from inside;

a connecting piece bent from an end part in the direction of the rotation axis of the supporting piece toward inside in a radial direction; and

a fitting piece bent from an end part inside in the radial direction of the connecting piece toward outside in the direction of the rotation axis, wherein

a fitting hole into which the fitting piece fits is provided on a face inside in the direction of the rotation axis of the cap supporting part.

11. The image forming apparatus according to claim **10**, wherein the fitting pieces and the fitting holes are provided in a pair.

12. The image forming apparatus according to claim **9**, wherein the supporting member includes a deviation-preventing part disposed outside in the direction of the rotation axis of the end cap.

13. The image forming apparatus according to claim **12**, wherein a circular projection is provided on a face inside in the direction of the rotation axis of the deviation-preventing part.

14. The image forming apparatus according to claim **9**, wherein the fixing device further includes:

a detected part provided on an outer circumferential face of the end cap; and

a sensor configured to detect rotation of the detected part.

15. The image forming apparatus according to claim **9**, wherein the heat source is an IH coil configured to generate a magnetic field to heat the fixing belt.

16. The image forming apparatus according to claim **15**, wherein at least a part of the supporting member is made of a material developing heat by a magnetic field generated by the IH coil.

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